What is claimed is

1. A wavelength stabilizing apparatus used in an optical module for controlling a light wave output from a tunable optical element comprising:

a coarse-tuning module comprising：

a first beam-splitting element receiving and dividing the light wave into a plurality of light waves;

a first optical filtering element receiving at least one of the plurality of light waves and filtering off part channels of the light waves; and

two photo-detecting elements transforming the light waves into a first electrical signal and a second electrical signal, respectively;

a fine-tuning module comprising：

a beam-splitting element dividing a received light wave into a plurality of light waves;

a Fabry-Perot Etalon separating light waves having specific wavelength out of the plurality of light waves from the beam-splitting element; and

two photo-detecting elements receiving the light waves having specific wavelength and transforming them into a third electrical signal and a fourth electrical signal, respectively; and

a servo element receiving the first, second, third, and fourth electrical signals to perform a signal processing;

wherein the servo element performs coarse-tuning and channel recognition of the light wave output from the tunable optical element on the basis of a voltage value relating to the first and second electrical signals, and performs fine-tuning and servo control of the light wave output from the tunable optical element with an error signal being a voltage value relating to the third and fourth electrical signals.

2. The wavelength stabilizing apparatus set forth according to claim 1, wherein the relative curve with respect to wavelength and transmittance of the first optical filtering element has a nonzero slope.

3. The wavelength stabilizing apparatus set forth according to claim 1, wherein the first beam-splitting element in the coarse-tuning module is provided with a first coated-film surface and a second coated-film surface.

4. The wavelength stabilizing apparatus set forth according to claim 1, wherein the beam-splitting element in the fine-tuning module is a polygon beam-splitting prism.

5. The wavelength stabilizing apparatus set forth according to claim 1, wherein the first optical filtering element is a high pass edge filter.

6. The wavelength stabilizing apparatus set forth according to claim 1, wherein the first optical filtering element is provided between the first beam-splitting element and one of the photo-detecting elements of the coarse-tuning module.

7. The wavelength stabilizing apparatus set forth according to claim 1, wherein the first optical filtering element is provided between the first beam-splitting element and the photo-detecting elements of the coarse-tuning module.

8. The wavelength stabilizing apparatus set forth according to claim 1, wherein the coarse-tuning module further comprises a second beam-splitting element provided between the first beam-splitting element and the first optical filtering element.

9. The wavelength stabilizing apparatus set forth according to claim 8, wherein the second beam-splitting element is provided with a coated-film surface.

10. The wavelength stabilizing apparatus set forth according to claim 8, wherein the coarse-tuning module further comprises a second optical filtering element provided between the first optical filtering element and one of the photo-detecting elements of the coarse-tuning module, and a first photo-detecting element receiving directly the light wave from the second

beam-splitting element.

11. The wavelength stabilizing apparatus set forth according to claim 8, wherein the coarse-tuning module further comprises a second optical filtering element provided between the first optical filtering element and the photo-detecting elements of the coarse-tuning module, and a first photo-detecting element receiving directly the light wave from the second beam-splitting element.

12. The wavelength stabilizing apparatus set forth according to claim 10, wherein a relative curve with respect to wavelength and transmittance of the second optical filtering element has a nonzero slope.

13. The wavelength stabilizing apparatus set forth according to claim 11, wherein a relative curve with respect to wavelength and transmittance of the second optical filtering element has a nonzero slope.

14. The wavelength stabilizing apparatus set forth according to claim 10, wherein the coarse-tuning module further comprises a third optical filtering element provided between the second optical filtering element and the photo-detecting elements of the coarse-tuning module, and a second photo-detecting element receiving directly the light wave from the first optical filtering element.

15. The wavelength stabilizing apparatus set forth according to claim 11, wherein the coarse-tuning module further comprises a third optical filtering element provided between the second filtering element and one of the photo-detecting elements of the coarse-tuning module, a fourth optical filtering element provided between the second optical filtering element and the first optical filtering element, and a second photo-detecting element receiving directly the light wave from the fourth optical filtering element.

16. The wavelength stabilizing apparatus set forth according to claim 14, wherein a relative curve with respect to wavelength and transmittance of the third optical filtering

element has a nonzero slope.

17. The wavelength stabilizing apparatus set forth according to claim 15, wherein a relative curve with respect to wavelength and transmittance of the third optical filtering element and the fourth optical filtering element each has a nonzero slope.

18. A wavelength stabilizing control method used in an optical module for controlling a light wave output from a tunable optical element comprising:

a step of inputting the light wave into a coarse-tuning module and a fine-tuning module;

a step of transforming the light wave output from the coarse-tuning module and the fine-tuning module into electronic signals; and

a step of performing a signal processing with the electronic signals;

wherein the electronic signals transformed from the coarse-tuning module are taken as basis for coarse-tuning and channel recognition of the light wave output from a tunable optical element, and the electronic signals transformed from the fine-tuning module are processed to obtain an error signal for fine-tuning and servo control of the light wave output from a tunable optical element.

19. The wavelength stabilizing control method set forth according to claim 18, wherein the inputting step further comprises steps of dividing the light wave into a first light wave and a second light wave; dividing the second light wave into a third light wave and a fourth light wave; dividing the fourth light wave into a fifth light wave and a sixth light wave; filtering off part channels of the first light wave; separating a light wave including specific wavelength out of the fifth light wave; and separating a light wave having specific wavelength out of the sixth light wave; and the transforming step further comprises steps of transforming the first light wave of which parts channels being filtered off, the third light wave of which parts channels being filtered off, the light wave with specific wavelength from the fifth wavelength, and the light wave with specific wavelength from the sixth wavelength

into a first electronic signal, a second electronic signal, a third electronic signal, and a fourth electronic signal, respectively; and the signal processing step performs coarse-tuning and channel recognition of the light wave output from a tunable optical element on the basis of a voltage ratio of the first electronic signal to the second electronic signal, and performs fine-tuning and servo control of the light wave output from a tunable optical element with an error signal being selected from a voltage difference between the third electronic signal and the fourth electronic signal, and a voltage ratio of the voltage difference between the third electronic signal and the fourth electronic signal to the second electronic signal.

20. The wavelength stabilizing control method set forth according to claim 18, wherein the inputting step further comprises steps of dividing the light wave into a first light wave and a second light wave; dividing the second light wave into a third light wave, a fourth light wave, and a fifth light wave; filtering off part channels of the first light wave; separating a light wave having specific wavelength out of the fourth light wave; and separating a light wave having specific wavelength out of the fifth light wave; and the transforming step further comprises steps of transforming the first light wave of which part channels being filtered off, the third light wave of which part channels being filtered off, the light wave with specific wavelength from the fourth light wave, and the light wave with specific wavelength from the fifth light wave into a first electronic signal, a second electronic signal, a third electronic signal, and a fourth electronic signal; and the signal processing step performs coarse-tuning and channel recognition of the light wave output from a tunable optical element on the basis of a voltage ratio of the first electronic signal to the second electronic signal, and performs fine-tuning and servo control of the light wave output from a tunable optical element with an error signal being selected from a voltage difference between the third electronic signal and the fourth electronic signal, and the voltage ratio of the voltage difference between the third electronic signal and the fourth electronic signal to the second electronic signal.

21. The wavelength stabilizing control method set forth according to claim 18, wherein the inputting step further comprises steps of dividing the light wave into a first light and a second light; dividing the first light wave into a third light wave and a fourth light wave; dividing the second light wave into a fifth light wave and a sixth light wave; separating a light wave having specific wavelength out of the fifth light wave; and separating a light wave having specific wavelength out of the sixth light wave; and the transforming step further comprises steps of transforming the third light wave, the fourth light wave, the light wave with specific wavelength from the fifth light wave, and the light wave with specific wavelength from the sixth light wave into a first electronic signal, a second electronic signal, a third electronic signal, and a fourth electronic signal, respectively; and the signal processing step performs coarse-tuning and channel recognition of the light wave output from a tunable optical element on the basis of a value selected from a voltage ratio of the first electronic signal to the voltage sum of the first electronic signal and the second electronic signal, and a voltage ratio of the voltage difference between the first electronic signal and the second electronic signal to the voltage sum of the first electronic signal and the second electronic signal, and performs fine-tuning and servo control of the light wave output from a tunable optical element with an error signal being selected from a voltage difference between the third signal electronic signal and the fourth electronic signal, and a voltage ratio of the voltage difference between the third electronic signal and the fourth electronic signal to the voltage sum of the first electronic signal and the second electronic signal.

22. The wavelength stabilizing control method set forth according to claim 18, wherein the inputting step further comprises steps of dividing the light wave into a first light wave and a second light wave; separating the first light wave into a third light wave and a fourth light wave; filtering off part channels of the third light wave; dividing the second light wave into a fifth light wave and a sixth light wave; separating a light wave having specific

light wave out of the fifth light wave; and separating a light wave having specific wavelength out of the sixth light wave; and the transforming step further comprises steps of transforming the third light wave of which part channels being filtered off, the fourth light wave, the light wave with specific wavelength from the fifth light wave, and the light wave with specific wavelength from the sixth light wave into a first electronic signal, a second electronic signal, a third electronic signal, and a fourth electronic signal, respectively; and the signal processing step performs coarse-tuning and channel recognition of the light wave output from a tunable optical element on the basis of a value selected from a voltage ratio of the first electronic signal to the voltage sum of the first electronic signal and the second electronic signal, and the voltage ratio of the voltage difference between the first electronic signal and the second electronic signal to the voltage sum of the first electronic signal and the second electronic signal, and performs fine-tuning and servo control of the light wave output from a tunable optical element with an error signal being selected from a voltage difference between the third electronic signal and the fourth signal, and a voltage ratio of the voltage difference between the third electronic signal and the fourth electronic signal to the voltage sum of the first electronic signal and the second electronic signal.

23. The wavelength stabilizing control method set forth according to claim 18,wherein the inputting step further comprises steps of dividing the first light wave into the first light wave and the second light wave; dividing the first light wave into a third light wave and a fourth light wave; dividing the second light wave into a fifth light wave and a sixth light wave; separating a light wave with specific wavelength out of the fifth light wave; separating a light wave with specific wavelength out of the sixth light wave; dividing the third light wave into a seventh light wave and a eighth light wave; and filtering off part channels of the seventh light wave; and the transforming step further comprises steps of transforming the seventh light wave of which part channels being filtered off, the eighth light

wave, the fourth light wave, the light wave with specific wavelength from the fifth light wave, the light wave with specific wavelength from the sixth light wave into a first electronic signal, a second electronic signal, a third electronic signal, a fourth electronic signal, and a fifth electronic signal, respectively; and the signal processing step performs coarse-tuning and channel recognition of the light wave output from a tunable optical element on the basis of a value selected from a voltage ratio of the third electronic signal to the second electronic signal, and a voltage ratio of the third electronic signal to the first electronic signal, and performs fine-tuning and servo control of the light wave output from a tunable optical element with an error signal selected from a voltage difference between the fourth electronic signal and the fifth electronic signal, and a voltage ratio of the voltage difference between the fourth signal and the fifth electronic signal to the third electronic signal.

24. The wavelength stabilizing control method set forth according to claim 18, wherein the inputting step further comprises steps of dividing the light wave into a first light wave and a second light wave; dividing the first light wave into a third light wave and a fourth light wave; dividing the second the second light wave into a fifth light wave and a sixth light wave; separating a light wave with specific wavelength out of the fifth light wave; separating a light wave with specific wavelength out of the sixth light wave; filtering off part channels of the third light wave; dividing the third light wave with part channels filtered off into a seventh light wave and a eighth wave; and the transforming step further comprises steps of transforming the seventh light wave, the eighth light wave, the fourth light wave, the light wave with specific wavelength from the fifth light wave, and the light wave with specific wavelength from the sixth light wave into a first electronic signal, a second electronic signal, a third electronic signal, a fourth electronic signal, and a fifth electronic signal, respectively; and the signal processing step performs coarse-tuning and channel recognition of the light wave output from a tunable optical element on the basis of a value

selected from a voltage ratio of the third electronic signal and the second electronic signal, and a voltage ratio of the third electronic signal to the first electronic signal, and performs fine-tuning and servo control of the light wave output from a tunable optical element with an error signal selected from a voltage difference between the fourth electronic signal and the fifth electronic signal, and a voltage ratio of the voltage difference between the forth electronic signal and fifth electronic signal to the third electronic signal.

25. The wavelength stabilizing control method set forth according to claim 18, wherein the inputting step further comprises steps of dividing the light wave into a first light wave and a second light wave; dividing the first light wave into a third wave and a fourth light wave; dividing the second light wave into a fifth light wave and a sixth light wave; dividing the third light wave into a seventh light wave and a eighth light wave; separating a light wave with specific wavelength out of the fifth light wave; separating a light wave with specific wavelength out of the sixth light wave; filtering off part channels of the seventh light wave; and dividing the seventh light wave of which part channels being filtered off into a ninth light wave and a tenth light wave; and the transforming step further comprises steps of transforming the ninth light wave, the tenth light wave, the eighth light wave, the fourth light wave, the light wave with specific wavelength from the fifth light wave, the light wave with specific wavelength from the sixth light wave into a first electronic signal, a second electronic signal, a third electronic signal, a fourth electronic signal, a fifth electronic signal, and a sixth electronic signal, respectively; and the signal processing step performs coarse-tuning and channel recognition of the light wave output from a tunable optical element on the basis of a value selected from a voltage ratio of the fourth electronic signal and the third electronic signal, a voltage ratio of the fourth electronic signal and the second electronic signal, and a voltage ratio of the fourth electronic signal to the first electronic signal, and performs fine-tuning and servo control of the light wave output from a tunable

optical element with an error signal being a voltage difference between the fifth electronic signal and the sixth electronic signal.

26. The wavelength stabilizing control method set forth according to claim 18, wherein the inputting step further comprises steps of dividing the light wave into a first light wave and a second light wave; dividing the first light wave into a third wave and a fourth light wave; dividing the second light wave into a fifth light wave and a sixth light wave; filtering off part channels of the third light wave; separating a light wave with specific wavelength out of the fifth light wave; separating a light wave with specific wavelength out of the sixth light wave; dividing the third light wave of which part channels being filtered off into a seventh light wave and an eighth light wave; filtering off part channels of the seventh light wave; dividing the seven light wave of which part channels being filtered off into a ninth light wave and a tenth light wave; and filtering off part channels of the ninth light wave; and the transforming step further comprises steps of transforming the ninth light wave of which part channels being filtered off, the tenth light wave, the eighth light wave, the fourth light wave, the light wave with specific wavelength from the fifth light wave, the light wave with specific wavelength from the sixth light wave into a first electronic signal, a second electronic signal, a third electronic signal, a fourth electronic signal, a fifth electronic signal, and a sixth electronic signal, respectively; and the signal processing step performs coarse-tuning and channel recognition of the light wave output from a tunable optical element on the basis of a value selected from a voltage ratio of the fourth electronic signal and the third electronic signal, a voltage ratio of the fourth electronic signal and the second electronic signal, and a voltage ratio of the fourth electronic signal to the first electronic signal, and performs fine-tuning and servo control of the light wave output from a tunable optical element with an error signal being a voltage difference between the fifth electronic signal and the sixth electronic signal.